# POSSIBILITY OF PRODUCING ETHANOL BY USING *MORINGA OLEIFERA* PODS HUSK

**MOHAMAD ZULFADZLI BIN JAMALUDIN**

**BACHELOR OF CHEMICAL ENGINEERING (GAS TECHNOLOGY)**
**UNIVERSITI MALAYSIA PAHANG**

# POSSIBILITY OF PRODUCING ETHANOL BY USING *MORINGA OLEIFERA* PODS HUSK

**MOHAMAD ZULFADZLI BIN JAMALUDIN**

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## SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Chemical Engineering (Gas Technology).

Signature :
Name of main supervisor : DR. EMAN N ALI
Position : SENIOR LECTURER
Date : 6/11/14

## STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature :
Name : MOHAMAD ZULFADZLI BIN JAMALUDIN
ID Number : KC10036
Date : JULY 2014

***Dedication***

*I dedicate this research thesis to my parents, Jamaludin bin MohdSaman and ZareianabintiHamdan, who give me advices, morale support and pray for my wellness throughout the thesis writing process. Besides that, I would like to dedicate this thesis to my family and friends who are supporting me until this very end.*

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# ABSTRACT

Instead of using the conventional fuels, nowadays people are using biomass fuels such as ethanol to replace the conventional one like diesel and petrol because the fuels are having some shortage of sources problem and hiking in price. The shortage is due to time consumed during the drilling and processing from the underground until it passed through the piping system in order to fulfil demands from customers. Currently, researchers are developing the uses of biofuels for industrial and transportation purposes especially bioethanol. There are numerous raw materials that can be used in producing ethanol such as rice husk, corn husk, wheat straw, millet husk, and also *Moringaoleifera* husk. This *Moringaoleifera* plant is a plant that has multifunctional uses. From its roots until the leaves, all of them can be used in medicinal prospects. The composition of cellulose, lignin and other components also similar to the composition of corn husk which means it is possible to produce ethanol from this *Moringaoleifera* plant. In order to have a better quality of ethanol, few steps must be followed according to the researches did by past researchers. The steps that need to be followed are separated into three parts, pre-treatment of materials, hydrolysis process using alkaline technique with sodium hydroxide solution (NaOH), a fermentation process using Simultaneous Saccharification and Fermentation (SSaF) with enzymes and Saccharomyces cerevisiae yeast cells. For the last one is the analysis procedure of ethanol concentration to determine the different in concentration of ethanol produce in different parameter. The fermentation is done by manipulating the size of sample, concentration of yeast added, and pH value of sample which means the analysis is run after 72 hours of fermentation time. The ideal temperature for fermentation is 36°C and being put in the shaker at 150 rpm. The analysis method for detecting the presence of ethanol in the sample is by using a High Performance Liquid Chromatography (HPLC) with refractive index detector (Agilent 1200 Series Refractive Index Detector) and organic acid column (REZEX ROA-Organic Acid HPLC Column). 0.05 N Sulphuric acids (H2SO4) is used as the solvent for this analysis. After 6 hours of running the analysis, the result was taken to be discussed further and based on the analysis and discussions, the sample of bigger size, 4.5 pH added with 1g of yeast produced more ethanol concentration compare to the other parameter. The highest concentration produce is 0.007 g/L.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| BP | BP Chemical Sdn. Bhd. |
| EC | European Commission |
| FFA | Free Fatty Acid |
| GRFA | Global Renewable Fuels Alliance |
| RPM | Round Per Minute |
| SSaF | Simultaneous Saccharification and Fermentation |

# 1 INTRODUCTION

## *1.1 Background of Study*

In this hustle and bustle world today, many people concerned about the nature, the energy being used every day, and it effects to our future generation. Currently, the supply for the energy like petrol is having a decline in production. Due to the climate changes and a very high demand for energy around the world, we are urged to search for alternative sources of energy that can help us living our life as peaceful as now and have the performance similar with the conventional one.

This problem has led to the resurrection in the development of bioethanol. Bioethanol or known as biomass energy is considered as a second-generation feedstock for the production of renewable biological energy sources. Biomass or bioethanol is an alternative energy replacing the conventional fuels and it is also a reliable source of energy. Besides that, bioethanol nowadays has caught some interest from people in the industry as it is proved that it can be used in transportation purposes. Nowadays, production of bioethanol has expanded by upgrading the uses of materials like sugar cane and corn which are common to human and not disturbing our food sources (Abbas and Ansumali, 2010).

There are many types of raw materials or sources can be used in producing this bioethanol worldwide like the one have been mentioned earlier. There are some more materials such as coconut husks, rice husks, corn husks, millet husks, wheat straw and also *Moringaoleifera* husks. Husks are very low cost and for human, husks are like a waste and most of them were disposed and burnt. So, it will not affect our food chain sources. Furthermore, based on the research and studied done by the researchers before, the composition in the husks itself can be used in producing bioethanol or specifically ethanol. The content of sugar or any materials that can be converted into sugars were there and it proves that husks, especially *Moringaoleifera* husks can produce ethanol after undergoing several processes.

*Moringaoleifera* is a plant that has multi purposes in health and medicinal aspect. It is known as 'The Miracle Tree' in some countries for its benefits to human being. This plant is very useful from its leaves until roots. The roots can be used in treating rheumatism while the juice from its leaves can be used to stabilize blood pressure for those who have high blood pressure. The flowers also are used to cure inflammations, the seeds powder as coagulant in water purification, the chewed bark as digestive and the pods are used for joint pain. Furthermore, Dr. Geoff Folkard and John Sutherland had worked on substituting *Moringaoleifera* seeds for alum to remove solids in water for drinking and they were successful in removing as much solid material as alum (Papillo, 2013). *Moringaoleifera* is also a very nutritious plant which contains 61% daily Magnesium, 41% of Potassium, 71% Iron, 22% of Vitamin C, and high content Calcium and Vitamin A. Besides its composition of beneficial components, *Moringaoleifera* plant also give lots of other benefits such as boosting energy level, strengthen immune system and act as antioxidant and anti-cholesterol agents (Dawson, 2013).

Seeds of *Moringaoleifera* have high possibility for the production of vegetable oil and have been identified and testified as one of the most promising non-edible oil-bearing seeds for the production of biodiesel (Martin et al., 2010). So, it is not possible for *Moringaoleifera* to be used in ethanol biofuel production. As an alternative which has been mentioned earlier, *Moringaoleifera* husks can be used to produce ethanol as biomass energy. As a conclusion, instead of using the seeds of *Moringaoleifera* for biodiesel production, the husks that left over by human can be used for bioethanol production. In addition for some exempted cases, the husks are used as solid fuel or as the raw materials for activated charcoal production. Moreover, it is biodegradable, nontoxic and not a cause for pollution. So, it can be classified and recognised as a good biological source for ethanol production.

## 1.2 *Problem statement*

Bioethanol is a renewable source of energy produced by fermentation method. Instead of taking a long time to produce new source of energy like fossil fuels, bioethanol can be produced in a shorter period. The use of ethanol has been recognised in some countries in Africa, Brazil, United States, and other European countries. An increase of demand for energy like bioethanol lead to this study and research as the existed energy source (fossil fuels) is having a problem of shortage of supply and highly cost to users. The main problem in producing bioethanol is to recognise the suitable and reliable raw materials. Most of the materials used for ethanol production are sugar based feedstock. Instead of using the same materials like millet husks, coconut husks and rice husks, we are keen to investigate the possibility of producing ethanol by using *Moringaoleifera* husks. While the plant is already known as a miracle tree, we are going to prove that even the pods husks can benefit human.

## 1.3 *Objective of research*

While other countries are starting to develop the uses of bioethanol to replace the conventional one like fossil fuels, we are focusing on the study of possibility to produce ethanol using *Moringaoleifera* plant. The aim of this research study is to produce a qualitative source of renewable energy known as bioethanol by using the *Moringaoleifera*pods husks. Hence, this research is more focus on the composition *of Moringaoleifera* that can be used in producing ethanol and promoting the benefits of using this kind of energy source. Otherwise, we are very pleased to promote that husks which most of the time has been ignored and disposed have all the specifications and requirements to turn itself from wastes to a precious thing such as ethanol.

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